M2009

12th Annual Data Mining Conference

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Impact of Analytics Program on an Emergent Economy: The Mexican Case

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Agenda

- Background.
- About our academic and research center.
- Change bound to a profound focus on analytics.
- Diploma in Data Mining.
- Masters Program in Analytic Intelligence.
- Impact of an analytics program on an emergent economy.

Background

- Graduate programs in engineering traditionally provide scarce foundations in analytics.
- Lack of specific materials in applied analytics such as data mining.
- Few text books show with sufficient clarity the analytic tools.
- Inadequate focus of quantitative analysis.
  - Too mathematical oriented.
  - Trivial (point-and-click).
  - The need of a compromise between the two extremes.

Background

- Few applications with high level analytical tools.
- Decision Analysis professors did not show:
  - An adequate focus on the analytics subject.
  - Analytical abilities with practical applications in business.
  - Information about high level computational tools.
  - Excitement towards the novelty and complexity of the subject.

Our Academic Center: CADIT

- Center of High Management in Engineering and Technology (ascribed to the School of Engineering)
- Inaugurated in 1996. Has granted 300 master and 15 doctorate degrees since then.
- Currently there are 150 students registered.
- Our personnel:

10 Full time professors (70% Ph.D's)

20 Part time professors (50% Ph.D's)

10 Research assistants (students with scholarship)

5 Administrative staff

Our Academic Center: CADIT

Specialization Degree	• Decision Analysis • Information Systems • Logistics and Manufacturing • Strategic Management • Data Mining (under approval process)
Master Degree	• Industrial Engineering • Engineering MBA. • Information Technologies • Supply Chain Management. • Analytical Intelligence (under approval process)
Doctorate Degree	• Industrial Engineering

Change bound to a profound focus on analytics

- Began in 2005 when Guillermo Híjar was named director of CADIT and Dr. Viterbo Berberena was appointed professor of Analytics.

- The issue was tackled immediately with the design and development of executive and actualization courses:

Diploma degree (120 hours)

- Data Mining with SAS Enterprise Miner.
- Applied Analytics using JMP Software.

Change bound to a profound focus on analytics

Short courses

(50 hours)

- Business analytics with SAS Enterprise Miner.
- Market research and database marketing with SAS analytical tools.
- Design of experiments for marketing.
- Credit scoring with SAS Enterprise Miner.

Diploma in Data Mining

- Initial Program (159 hours in duration) was developed jointly with SAS Institute Mexico.
- Objectives:

Identify business problems from the database marketing perspective.

Understand the difficulties that arise by using operational databases from the database marketing perspective.

Select and correctly apply the analytical data mining techniques in order to uncover customer behavior.

Utilize the data mining methodology appropriately.

Effectively operate the data mining tool in order to perform customer profiling, product association for cross-selling, loyalty, retention and prospect conversion analysis, advertising response and publicity campaign analysis, fraud detection, risk analysis and many others.

Diploma in Data Mining

- Data Mining Course's Series:

Workshop 1:	• Introduction to Market Research and Databases. (33 hours)
Workshop 2:	• A Practical Approach to SAS Enterprise Miner. (30 hours)
Workshop 3:	• Predictive Modeling and Supervised Market Segmentation. (45 hours)
Workshop 4:	• Non-Supervised Market Segmentation. (24 hours)
Workshop 5:	• Association and Sequence Analysis. (27 hours)

Diploma in Data Mining

- At the end of each workshop, a case study must be developed by the student or in focus groups. These case studies will integrate a business management component consisting of oral presentations and written reports, allowing the student to solve complex business issues by way of SAS technology.

- Students will receive both the Anahuac Diploma and the SAS Data Mining Certificate, after successfully completing the requirements in all five workshops.

Diploma in Data Mining

- SAS Institute support:
  - SAS Trainer's Kits.
    - In electronic format.
    - Analytical Suite operation.
    - Study cases and examples.
  - CADIT instructors trained at diverse Summer Programs in the US:
    - University of California, Long Beach campus.
    - SAS campus in Cary, NC.
  - Support of SAS Institute México specialists as instructors.

Diploma in Data Mining

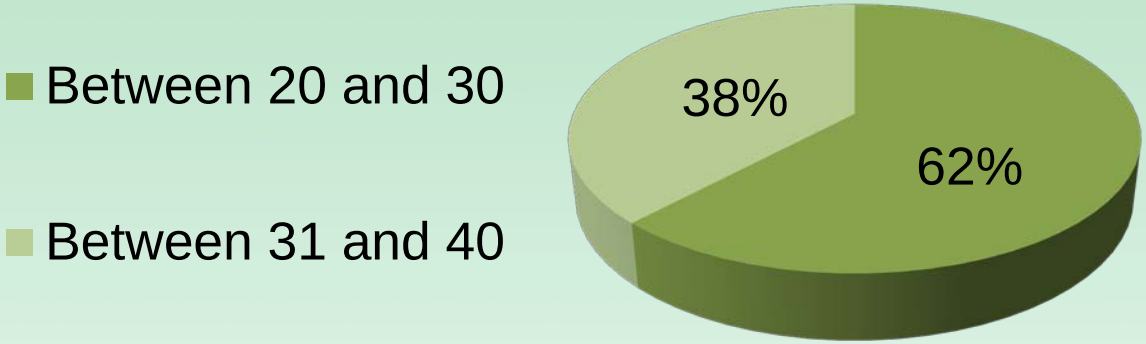
- VIP visits to CADIT:
  - Marianna Clampett, Vice President SAS.
  - Polly Mitchell Guthrie, Director, Academic Program SAS Americas.
  - Jerry Oglesby, Director, Global Academic Program & Global Certification Education Division SAS
  - Gordon Linoff, cofounder of Data Miners, Inc., a consultancy specializing in data mining, the coauthor of the bestselling data mining books.
- Visit to the Institute for Advanced Analytics in NCSU and experiences sharing with Dr. Michael Rappa and his team.
- Experiences sharing with SAS Education experts in NC.

During the start-up

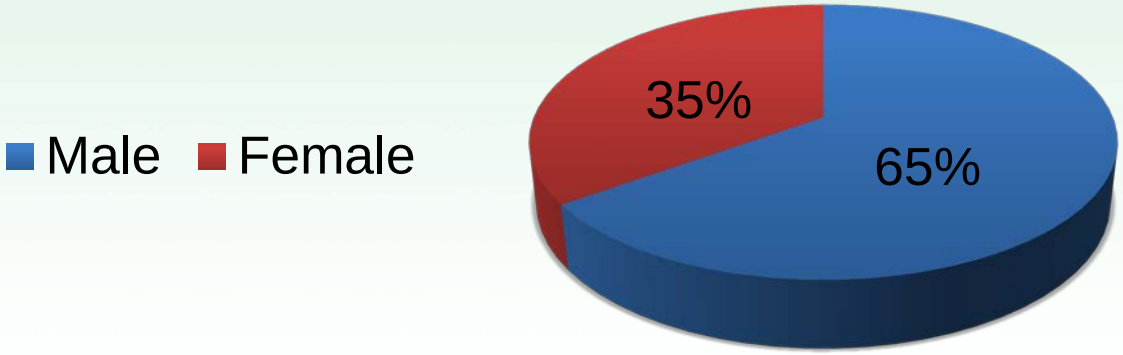
- High demand and appeal for the program
- Lack of professors
- Highly diversified participants' profile
- First appraisals and complaints
- Revision and improvement of the academic program
- Change from 159 to 120 hours due to a regulation from the Ministry of Education
- A majority of the Data Mining diploma recipients expressed a unique interest in a graduate program in Analytics Intelligence

Students' profile

- Age

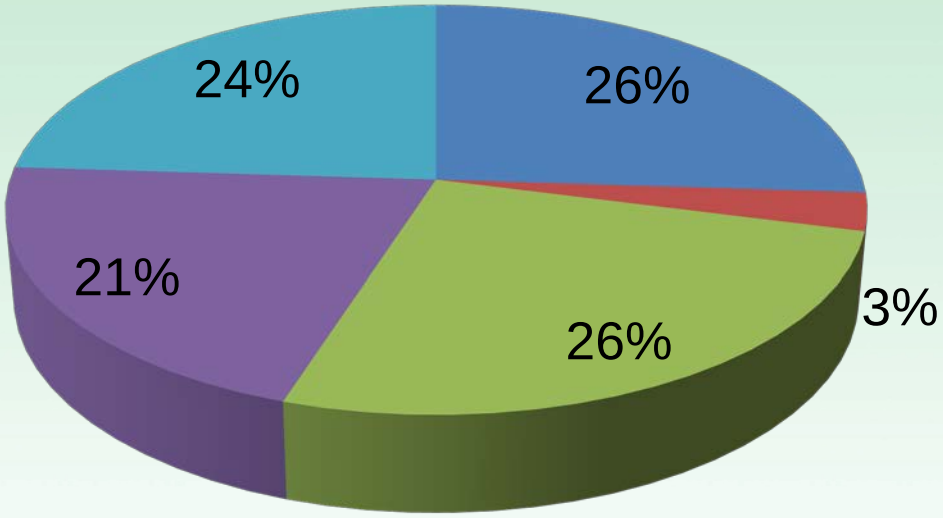


- Gender



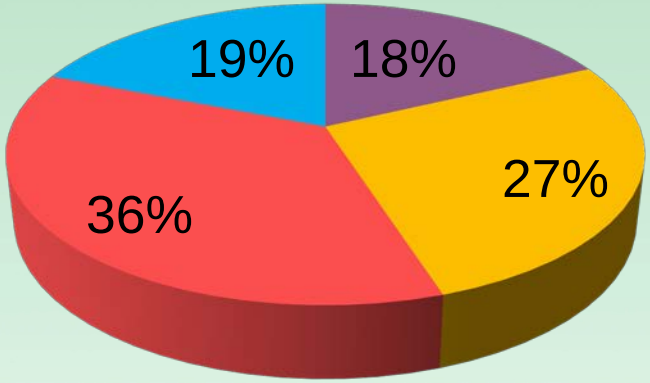
Students' profile

- College Degree☞ 56%

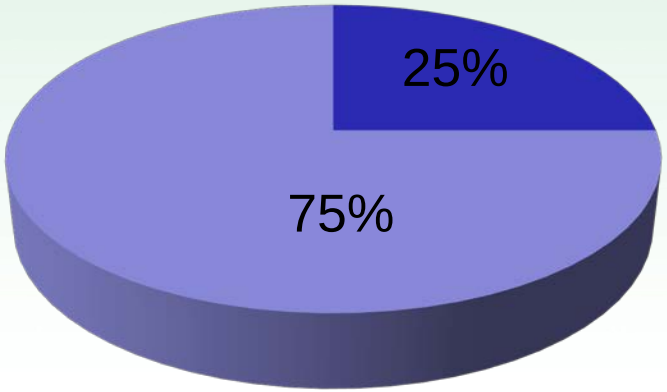


Students' profile

- Masters' Degree ☞ 32%
  - Computer Science
  - Engineering
  - Economy and business
  - Other



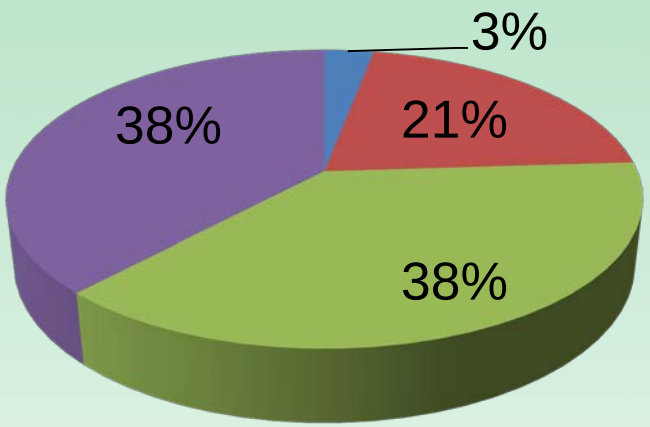
- Doctorate Degree ☞ 12%



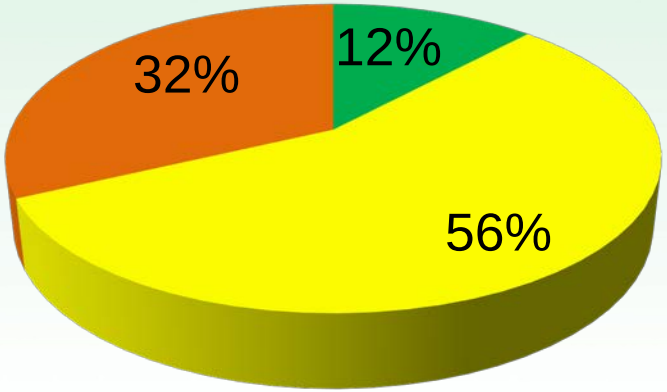
Engineering Other

Diploma in Data Mining

- Instructors' evaluation:
  - Unsatisfactory
  - Satisfactory
  - Good
  - Excellent

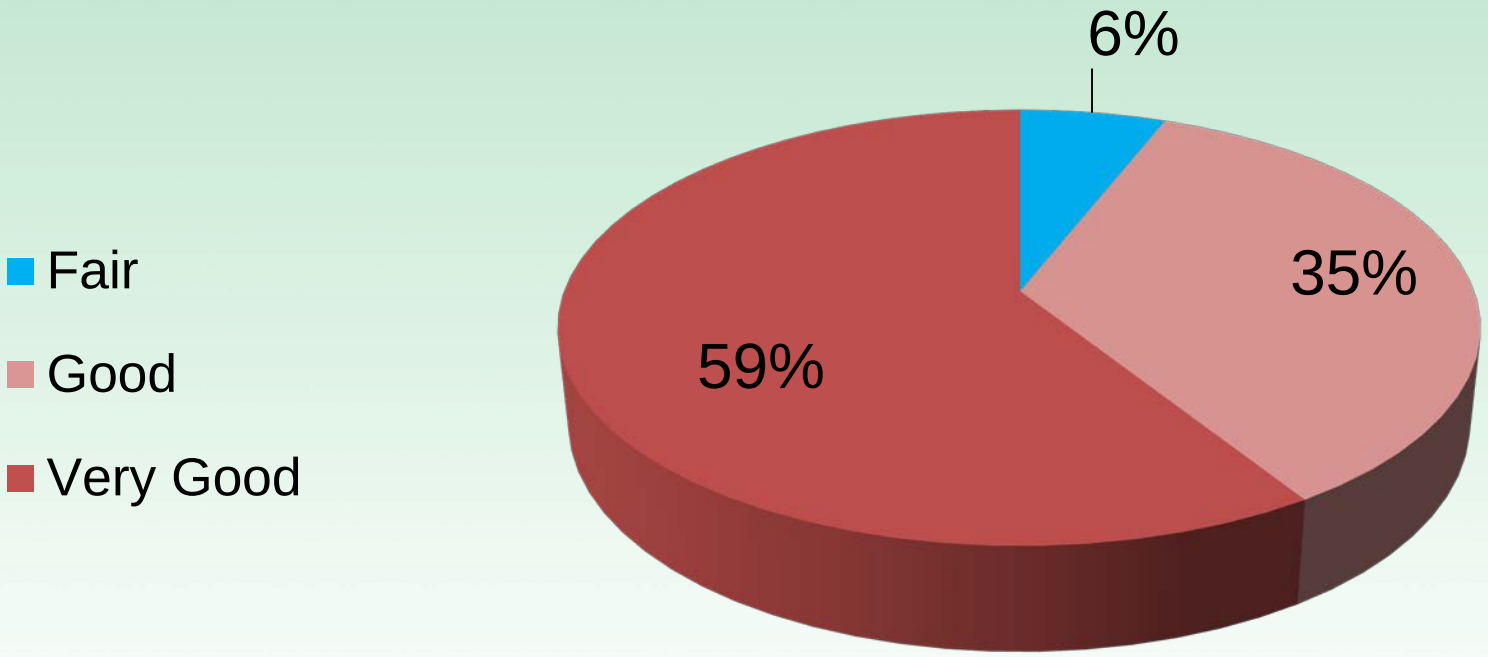


- Program evaluation:
  - Fair
  - Good
  - Very Good



Diploma in Data Mining

- Pertinence of the course evaluation:



Masters Program in Analytic Intelligence (Background)

- Previous experience with the executive programs.
- Research in Mexican universities.
- No other Master program is offered with this unique focus.
- Still, some mining data subjects are offered in Master programs in Business Intelligence.
- Sharing ideas with Dr. Michael Rappa, Director of the Institute for Advanced Analytics in NC State University.
- Sharing ideas with Dr. Jerry Oglesby, Director of SAS Global Academic Program and his team.
- The need of tropicalizing the ideas for the Mexican context.

Masters Program in Analytic Intelligence (Curriculum)

- **Program objective:**

  To develop professionals with a master of science level and theoretical and practical knowledge about the methodologies and tools of analytic intelligence, who are capable of an outstanding performance in private or public companies in any business area which generates huge amounts of data from which is necessary to extract information, knowledge and above all, intelligence.

Masters Program in Analytic Intelligence (Curriculum)

- **Incoming Profile:**

  A bachelor's degree in engineering, actuarial sciences, applied statistics or business administration with competences in quantitative methods of analysis. In general, any professional who is interested in analytic intelligence may take a propedeutic course in mathematics and applied statistics and approve a qualifying examination to be admitted.

Masters Program in Analytic Intelligence (Curriculum)

- **Outgoing Profile:**

  A Master in Analytical Intelligence is capable of using huge amounts of a company data to extract information and knowledge and use them for the development and exploitation of intelligence supporting models aimed to the continuous improvement and optimization of processes and the achievement of a highly competitive performance.

Masters Program in Analytic Intelligence (Curriculum)

Compulsory Courses

- Five courses (30 credits)

Data Mining knowledge area:

Four courses (24 credits)

- 1. “Exploratory data analysis”
- 2. “Analytical tools”
- 3. “Supervised models”
- 4: Any other course from this area of knowledge

Entrepreneurial knowledge area:

One course

(6 credits)

- 5. “Leadership and ethical values”

Masters Program in Analytic Intelligence (Curriculum)

Elective Courses

Eight courses (48 credits)

- From the Information Technologies knowledge area:
- Two courses (12 credits)

- From any other knowledge area:
- Six courses (36 credits)

Grand Total: 13 courses (78 credits)

Masters Program in Analytic Intelligence (Curriculum)

To obtain the degree there are three options:

Thesis:
Must take Thesis I and Thesis II courses (six credits each).

Term Project:
The student develops a final project with a practical application.

Complementary Courses:
The student must take any two other subjects (six credits each) or a 100 hours diploma course in addition to the Master Program credits.

Any of these options requires a general oral exam before three examinators.

Masters Program in Analytic Intelligence (Curriculum)

Typical Courses:

- Supervised models.
- Non-supervised models.
- Exploratory data analysis.
- Stochastic modeling and process simulation.
- Optimization.
- Design of experiments.
- Business intelligence.
- Analytics tools.
- Structural equations modeling.
- Advanced topics in analytics.

Impact of an analytics program on an emergent economy

- **By job function:**

Position	Before	After
Employee	38%	21%
Manager	29%	29%
Director	33%	50%

Impact of an analytics program on an emergent economy

- **By business sector:**

Sector	Before	After
Communications	9%	0%
Government	9%	17%
Retailing	3%	0%
Insurance	3%	0%
Banking	68%	58%
Services	0%	8%
Other	8%	17%

Impact of an analytics program on an emergent economy

- **By salary level:**

Payment range	Before	After
10,000 – 20,000	24%	0%
21,000 – 50,000	76%	92%
51,000 – 100,000	0%	8%

Impact of an analytics program on an emergent economy

- **Analytical competences required by the job function:**

Competence level	Before	After
Basic	15%	0%
Intermediate	47%	31%
Advanced	38%	69%

Impact of an analytics program on an emergent economy

- **Analytics performance level of the organization**

Analytics level	Before	After
Low	12%	0%
Medium	50%	38%
High	26%	31%
Very high	12%	31%

Impact of an analytics program on an emergent economy

- **Existence of a quantitative analysis culture:**

Culture	Before	After
Very Low	9%	0%
Low	18%	0%
Medium	38%	46%
High	26%	39%
Very high	9%	15%

Impact of an analytics program on an emergent economy

- **Existence of analytical tools in the organization:**

Performance level	Before	After
Basic	27%	15%
Intermediate	47%	31%
Advanced	26%	54%

Impact of an analytics program on an emergent economy

- **Acquisition of high performance analytical tools:**

Performance level	Before	After
Statistical software	47%	44%
Data miners	53%	56%

Impact of an analytics program on an emergent economy

- **Organizational attitude towards the training of personnel in analytical techniques:**

Attitude	Before	After
Skeptical	6%	0%
Indifferent	29%	38%
Optimistic	44%	31%
Very positive	21%	31%

Impact of an analytics program on an emergent economy

- **Recognition to personnel with analytical competencies:**

Recognition	Before	After
Low	3%	0%
Fair	26%	23%
Good	56%	31%
Very good	15%	46%

Impact of an analytics program on an emergent economy

- **Existence of analytic areas in an organization:**

Analytical area	Before	After
Yes	79%	85%
No	21%	15%

Impact of an analytics program on an emergent economy

- **Comprehension level of CEO's about analytical techniques:**

Understanding	Before	After
Minimal	9%	8%
Acceptable	38%	31%
Good	41%	38%
Very good	12%	23%

Impact of an analytics program on an emergent economy

- **Impact of analytical strategies in the competitive performance of an organization:**

Influence	Before	After
Low	18%	15%
Medium	44%	39%
High	38%	46%

Impact of an analytics program on an emergent economy

- **Degree of usage of the personnel intellectual capabilities in an organization:**

Usage	Before	After
Little	21%	23%
Much	79%	77%

Impact of an analytics program on an emergent economy

- **Personnel degree of satisfaction with his/her job in the organization:**

Satisfaction	Before	After
Low	9%	8%
Average	18%	15%
High	53%	38%
Very high	20%	39%

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- **Personnel self-esteem in the organization:**

Self-esteem	Before	After
Medium	15%	8%
High	59%	46%
Very high	26%	46%

Impact of an analytics program on an emergent economy

- **Degree of professional accomplishment of personnel in the organization:**

Accomplishment	Before	After
Low	3%	8%
Medium	26%	31%
High	56%	23%
Very high	15%	38%

Impact of an analytics program on an emergent economy. Conclusions

On Graduates:

- Competencies
- Salaries
- Professional accomplishment
- Self-esteem

Impact of an analytics program on an emergent economy. Conclusions

On Companies:

- Adoption of an analytical focus
- Creation of a quantitative analysis culture
- Acquisition of analytical tools
- Respect for the analytical functions
- Creation of areas of analysis
- Competitiveness improvement (Competing on analytics framework)
- Enhance of the organization top executives' understanding about the scope and benefits of analytic techniques

Impact of an analytics program on an emergent economy. Conclusions

On Society:

- Awareness and interest to apply quantitative analysis and analytical techniques in diverse social environments.
- Enhance of the social leaders' and government understanding about the scope and benefits of analytical techniques.
- Birth of a new culture of quantitative analysis within social environment besides business.